BUREAU OF STANDARDS

DEPARTMENT OF COMMERCE

NOV 22 1926
LIBRARY

TECHNICAL NEWS BULLETIN
OF THE BUREAU OF STANDARDS

Subscription, 25 cents a year (U. S.), 40 cents a year (Foreign). Address "Superintendent of Documents, Washington, D. C."

Washington, November 1926—No. 115

TWENTY-FIFTH ANNIVERSARY OF THE BUREAU OF STANDARDS

On March 3, 1901, during the last few minutes of the session, Congress passed a bill changing the name of the old Office of Standard Weights and Measures of the Treasury Department to the National Bureau of Standards, greatly enlarging its functions. The act provided for a staff of 14 persons, and also set aside a sum for the purchase of a suitable permanent site for the bureau.

The Bureau of Standards is now 25 years old. In this time it has grown from a minor bureau of the Government housed in temporary quarters, with a staff of only 14 employees, to be one of the foremost scientific and technical institutions in the world, with a staff of nearly 800 and with more than a dozen major buildings, each specially equipped for some particular class of work.

It is fitting that some notice should be taken of the completion of 25 years of scientific and technical research which has done so much for the country as a whole. Saturday, December 4, has been set aside as "Visitors Day," on which the bureau and its many friends will celebrate its twenty-fifth birthday. On that day the bureau will keep "open house," and it is expected that many of its friends will take this opportunity to inspect the laboratories and take a bird's-eye view of what has been called "The House of Wonder." A luncheon will be served in the middle of the day, and in the evening a banquet will be given by the staff at the New Willard Hotel. Among the guests will be Secretary Hoover, Dr. S. W. Stratton, president of Massachusetts Institute of Technology and for 22 years director of the bureau, and the members of the bureau's visiting committee.

COOPERATIVE INVESTIGATIONS IN COLORIMETRY BY THE MUNSELL RESEARCH LABORATORY AND THE BUREAU OF STANDARDS

For about four years the Munsell Research Laboratory (Baltimore, Md.), has been cooperating with the Bureau of Standards in colorimetric research.

The objective of this cooperative investigation is the establishment of the fundamental standards and data of colorimetry on a secure scientific basis. It is concerned largely with the psychophysical data of vision: Neutral stimulus ("white light"), brilliance (value) sensibility, hue sensibility, saturation (chroma) sensibility, the three elementary excitations, methods of observing and computing dominant wave length and purity, and the relations between these variables and hue and saturation. The nature of these problems has been indicated in the Appendix to B. S. Scientific Paper No. 417 (August, 1921).

In order to further this work the Munsell Laboratory has maintained a number of research associates who have worked at the bureau on various phases of this investigation.

As a result the following papers have been published:

1. Priest: "The colorimetry and photometry of daylight and incandescent illuminants * * *." Journal Optical Society of America and Review of Scientific Instruments, vol. 7, pp. 1175–1209; 1923.

2. Priest, McNicholas, and Frehafer: "Some tests of the precision and reliability of measurements * * * by the Koenig-Martens spectrophotometer." J. O. S. A. and R. S. I., vol. 8, pp. 201–212; 1924.

3. Priest: "Apparatus for determination of color in terms of dominant wave

length, purity, and brightness." J. O. S. A. and R. S. I., vol. 8, pp. 173–200; 1924.

4. Priest, Tuckerman, Ives, and Harris: "The computation of colorimetric purity." J. O. S. A. and R. S. I., vol. 9, pp. 503–520; 1924.

5. Priest: "The computation of colorimetric purity, II." J. O. S. A. and R. S. I., vol. 13, pp. 123–132; 1926.

6. Judd: "The computation of colorimetric purity." J. O. S. A. and R. S. I., vol. 13, pp. 133–154; 1926.

7. Gibson and Harris: The Lovibond Color System, I., A Spectrophotometric Analysis of the Lovibond Glasses. B. S. Scientific Paper (in press).

In addition the following abstracts give data or information which have not, as yet, received more adequate publication in complete papers:

1. Priest and Cottrell: "The effect of various conditions upon the determination of the normal stimulus of gray." J. O. S. A. and R. S. I., vol. 7, p. 73; 1923.

2. Priest: "Preliminary data on the color of daylight at Washington." J. O. S. A. and R. S. I., vol. 7, p. 78; 1923.

3. Priest: "Apparatus for hue sensibility and visibility of energy." J. O. S. A. and R. S. I., vol. 7, p. 99; 1923.

4. Priest: "Special apparatus for determination of normal stimulus of gray with full field illumination." J. O. S. A. and R. S. I., vol. 7, p. 100; 1923.

5. Priest, Gibson, and Munsell: "A comparison of experimental values of dominant wave length and purity with their values computed from the spectral distribution of the stimulus." J. O. S. A. and R. S. I., vol. 8, p 28; 1924.

6. Priest, Gibson, and Harris: "Measurements of illumination and color temperature at Washington during solar eclipse, January 24, 1925." Phy. Rev. (2), vol. 25, p. 901; 1925.

7. Priest, Gibson, and Harris: "Determination of the time of a solar eclipse from measurements of relative illumination." Phy. Rev. (2), vol. 25, p. 902; 1925.

8. Priest: "Gray skies and white snow." J. O. S. A. and R. S. I., vol. 11, p. 133; 1925, and J. Wash. Acad., vol. 15. p. 306; 1925.

9. Priest: "Standard artificial sunlight for colorimetric purposes." J. O. S. A. and R. S. I., vol. 12, p. 479; 1926.

10. Priest: "An experiment bearing on the adoption of a standard neutral stimulus in colorimetry." J. O. S. A. and R. S. I., vol. 13, p. 306; September, 1926.

11. Priest and Brickwedde: "Minimum perceptible colorimetric purity." J. O. S. A. and R. S. I., vol. 13, p. 306; September, 1926.

12. Priest: "Blue sky and white snow." J. O. S. A. and R. S. I., vol. 13, p. 308. September, 1926.

13. Priest and Gibson: "Apparatus for the determination of the visibility of energy and the fundamental scales of visual psychophysics." Eleventh Annual Meeting, Optical Society of America.

14. Tyndall: "Sensibility to wave length difference as a function of purity." Eleventh Annual Meeting, Optical Society of America.

15. Priest and Judd: "Sensibility to wave length difference and the precision of measurement of dominant wave length for yellow colors of high saturation." Eleventh Annual Meeting, Optical Society of America.

16. Priest: "An experiment on color discrimination under commonplace conditions." Eleventh Annual Meeting, Optical Society of America.

Of the more important results of these past four years has been the development and organization of the facilities for such research, so that the time and effort of a research associate may now be concentrated on his specific problem instead of being dissipated on mere preliminaries.

Temporary associates, having sufficient familiarity with the subject, are thus enabled to obtain definite valuable results in a relatively short time. For example, during the past summer, Prof. E. P. T. Tyndall, of the University of

Iowa, spent 12 weeks of his vacation here, studying "sensibility to difference in wave length as a function of purity." This is a colorimetric problem of great importance. As a result of those 12 weeks Professor Tyndall has made a valuable contribution to knowledge. His results were communicated to the Optical Society of America at its meeting in Philadelphia, October 21, and will be published shortly. This achievement was possible because standardized apparatus, unusual laboratory facilities, and the advice of permanent members of the staff were at his disposal. The preparation of the apparatus which he used was, however, a matter which had occupied years rather than weeks. This apparatus was also described at the current meeting of the Optical Society. ("Apparatus for the determination of the visibility of energy and the fundamental scales of visual psychophysics.") It provides the means for attacking in a systematic and unified manner several of the most fundamental problems of colorimetry. In an extensive program of determining the visual sensibilities the advantage of having one standard apparatus will be apparent to all who are acquainted with the elaborate calibrations and instrumental corrections incident to such work. Sporadic attempts at this kind of research are bound to be ineffective and wasteful of time and effort, and it is thought that much can be accomplished by coordination of the separate problems into a unified program.

Apparatus for the determination of color in terms of dominant wave length and purity (J. O. S. A. and R. S. I., vol. 8, pp. 173–200; 1924) permanently installed at the bureau is another example of results attained by this cooperative work. This apparatus has now been in use for over three years, and it provides the ready means for undertaking a great deal more fundamental research.

The development of methods and instruments for color grading incandescent illuminants and the various phases of natural and artificial daylight was, in point of time, the earliest result of these cooperative investigations. (J. O. S. A. and R. S. I., vol. 7, pp. 1175–1209; 1923.) For this purpose two instruments—(1) the "rotatory dispersion colorimetric photometer" and (2) the "blue wedge colorimetric photometer"—have been designed at the bureau and constructed in its instrument shop. The methods of using these instruments have been thoroughly tested and standardized. Since they provide the means for standardizing the color of sources of light, they are of great service in all of the psychophysical investigations. In fact, standardization of sources in terms of "color temperature" is now accepted as an indispensable preliminary in most psychophysical experiments in vision.

It is thus seen that, through the cooperation of the Munsell Laboratory, the bureau is now in possession of unique equipment and facilities for the prosecution of research in visual psychophysics and colorimetry.

THERMAL EXPANSION OF BERYLLIUM

A research is now in progress on the thermal expansion of beryllium and some of its alloys. This exceptionally light element appears to have an expansion coefficient considerably lower than the aluminum and magnesium elements. An element or alloy of low specific gravity and average expansion coefficient will find wide application in the industries, provided satisfactory mechanical properties are possessed by the material.

EFFECT OF CHANGES IN HUMIDITY ON LABORATORY WEIGHTS

Gold-plated laboratory weights of the common screw-knob type have been found in some cases to change with the humidity of the atmosphere much more than many lacquered sets. In experiments in which the relative humidity of the atmosphere has been changed from 30 to 70 per cent a few of the gold-plated sets showed changes in the sum of the weights from 1 gram to 50 grams, inclusive, of 0.5 to nearly 3 milligrams. Among several lacquered sets so far tested the largest change was under 1 milligram. Other sets, both lacquered

and plated, showed changes of only a very few tenths of a milligram. Changes are to be expected in lacquered weights, in view of the well-known fact that most, if not all, of the common kinds of lacquer are somewhat hygroscopic.

In all of these cases the loss when the humidity was lowered was about the same as the gain when the humidity was raised, and in some cases the raising and lowering were both repeated several times, showing definitely that the change was not a progressive, permanent one.

Two peculiarities appear to be true and are worth considering, but more work is necessary before they can be accepted as facts. The first is that the gold-plated weights so far tested seem to gain more slowly than they lose. When the relative humidity is changed suddenly from about 30 to 70 per cent they sometimes show relatively little change for the first day but continue to gain for several days. One set was gaining at the rate of about 0.1 milligram per day at the end of nine days. Then when the humidity was suddenly lowered the set lost several times as much on the first day as it had gained on the first day the humidity was raised. The lacquered weights seem to be more uniform in this respect. The other peculiarity is that much the greater part of the change, at least in the case of the gold-plated weights, seems to take place over a relatively small range of the higher humidities. One of the next phases of the investigation to be studied is this question, which may be of great practical importance in the use of such weights.

Since different sets, even from the same maker, differ greatly in respect to these changes, and without any evident difference in the appearance of the weights, each set must be considered individually, and only actual tests or proper experience covering a sufficient range of humidity can prove whether such changes occur in any particular set.

The bureau is planning to introduce as soon as practicable a routine test for this effect, in order to avoid certifying plated or lacquered screw-knob weights unless they are reasonably free from this source of change.

The reason for moderate changes in lacquered weights is evident, but in the case of plated weights the cause remains to be studied. It seems probable that it is to be found in electroplating salts left under the knob, a condition which would occur if the weights were dried without thoroughly rinsing out the plating liquid. Definite studies will be made on this point, but in the meantime it seems worth while for manufacturers to make every effort to guard against this possible cause of the difficulty.

MEXICAN TANNING MATERIALS

United States Consular Report No. 220758 describes six varieties of raw tanning materials indigenous to the Salina Cruz District in Mexico. Samples of these materials were analyzed for tannin at the request of the Bureau of Foreign and Domestic Commerce. These results are given below for the information of those interested. The names of the materials are those contained in the above-mentioned report.

Mexican tanning materials

[Results in per cent on moisture-free basis]

	Tepehauje bark	Timbre bark	Cascalote		Guamuche bark	Mangle bark
			Bark	Bean		
Soluble solids	38.66	42.42	19.69	55.03	45.68	38.76
Tannins	27.56	27.79	10.69	25.90	39.61	22.93
Nontannins	11.10	14.63	9.00	29.13	9.07	15.83
Ash	5.57	5.61	5.08	3.60	4.58	7.17
Purity	71.3	65.3	54.3	47.0	82.5	59.2
Ph value (solution of analytical strength)	4.65	4.78	3.97	3.55	3.80	4.36

With the possible exception of the Cascalote bark these materials appear to contain sufficient amounts of tannin to warrant their commercial use.

Color tests with sheepskin skivers gave the following results:

Tepehauje bark.—Dark reddish color.
Timbre bark.—Very light pink, similar to ordinary quebracho.

Cascalote bark _ Light color with slight red cast.
Cascalote bean _ Light color with yellow cast.
Guamuche bark_ Dull reddish color.
Mangle bark ___ Yellow, darker than osage orange.

USE OF GLUE IN COATED PAPER

There is a great deal of interest among manufacturers of coated papers in alternative adhesives for use in their industry. Therefore the bureau, in cooperation with the National Association of Glue Manufacturers, has investigated this matter.

The chief reasons advanced for not using glue have been price considerations, its lack of waterproofness, and reputed variations in quality. Furthermore, there has been some question of the printing qualities of glue-bound coated paper.

These factors have been studied in laboratory tests and by semicommercial runs in the experimental paper mill of the bureau. Commercial scale runs were made at a paper-coating plant. Printing tests of the papers coated were made frequently. A demonstration of the results was given to representatives of the glue and coated paper industries.

The results indicate that the proportion of glue required in coating mixtures varies with the grade of glue. When the better grade glues are used this proportion needed may be less than that of casein, the material now in general use.

Little change in present coating equipment and operating technic is required by the use of glue, since the various grades available offer a choice within which local conditions may be met. Uniformity in glue for coating purposes may be attained by drawing specifications to meet local and product requirements.

Ordinary glue-bound coated paper offers no new difficulties in printing except in those lithographic and possibly off-set processes where a high degree of water resistance is required.

This work is fully described in Technologic Paper No. 323 of the Bureau of Standards, copies of which may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 15 cents each.

STIPA ICHU GRASS AS A PAPER-MAKING MATERIAL

Stipa ichu grass, commonly called "ichu" grass, is indigenous to the regions of South America southward through the Andes to Argentina. In many parts of the Andes it is a dominant grass above the timber line.

Tests on ichu grass received from the Ecuador Legation have recently been made at the bureau to determine the value of the material as a potential source of paper pulp. The tests were limited to laboratory scale production and consisted of the usual paper-making processes of cooking and beating the material and converting the resultant pulp into sheets of paper. The sheets made were submitted to various physical tests which are applied in evaluation of paper.

Two cooking processes were included—one employing 25 per cent of caustic soda as the digesting agent; the other, 25 per cent of lime. The yield of paper-making pulp obtained was 25.5 and 56.6 per cent, respectively.

The yield from the lime "cook" compares favorably with that of commonly used paper-making materials, but the strength of the paper made from the pulp was insufficient to meet the usual requirements. The yield from the caustic process is not satisfactory from an economic standpoint, and to have bleached the resultant pulp would have required a relatively large amount of bleaching powder, the use of which would have further reduced the amount of pulp available for conversion into paper.

On account of low yield, high chemical consumption, and lack of strength, ichu grass is not considered a promising material for the manufacture of paper in general. As this grass gives a soft and bulky sheet, it might be used as a filler with the stronger-fibered pulps and would doubtless be a suitable material for the production of papers in which these qualities are desired.

19350—26——2

EXTRUSION MACHINE AUGER AND DIE INVESTIGATION

Pursuant to an item published in the June, 1926, Technical News Bulletin (No. 110), a further study has been made on the workability of clay and shale with the view of obtaining a clay or shale that would stand repeated pugging and extrusion without materially affecting the properties that govern their workability; accordingly, tests, similar to those reported in the item referred to above on Illinois plastic shale and Mount Savage No. 2 plastic fire clay, were made on a brick shale from central Maryland and a brick clay from eastern Maryland.

It was found that the workability of the brick shale decreased 195 per cent for a decrease of 8.6 per cent in moisture. The shale swedged poorly and could only be extruded twice; it would not flow under pressure when tempered with 14 per cent water, and with 18 per cent water it was very soft and would not hold its shape; with 16 per cent water it worked best, but not satisfactorily, as most of the water of plasticity squeezed out at pressures below 50 lbs./in.^{2}

The workability of the brick clay was found to remain practically constant during the first three or four extrusions, provided that the moisture content was kept within about 1½ per cent of the dry material by weight. When the number of extrusions was continued to 6, the workability changed 32 per cent for a moisture change of 7.7 per cent of the maximum moisture used. This is very moderate when compared with tests on the No. 2 plastic fire clay, which show a workability change of 37.4 per cent for a moisture change of 2 per cent during four extrusions.

From tests data obtained it is evident that the eastern Maryland brick clay is a tough medium plastic material the workability of which remains almost constant during repeated extrusions, rendering it of satisfactory workability for laboratory studies of the operation of extrusion machines.

ELASTICITY AND TRANSVERSE STRENGTH OF CLAYS AT ELEVATED TEMPERATURES

In continuation of the proposed outline of future work, referred to in the first progress report on the sagger clay investigation published in the March (1926) issue of the Journal of the American Ceramic Society, an apparatus has been developed to determine rapidly and with satisfactory accuracy the moduli of elasticity and rupture of representative clays. These properties are being determined on 10 by 1 by 1 inch specimen clay bars at room temperature, 750° C., 1,000° C., and at the temperature at which saggers made from these clays failed in the air-quenching test described in the above-mentioned report.

The apparatus consists essentially of three parts: (1) The furnace, (2) the lever arm below the furnace through which the load is applied to the specimen, (3) the gauges and support on which the gauges are mounted. The furnace is of the horizontal muffle electrically heated type, the heat being generated in nichrome wire coils placed on either inner side of the furnace. The heated chamber, which is well insulated, measures approximately 4 by 4 by 12 inches. A cover, which forms the top of the furnace, is readily removable to facilitate proper setting up of the specimen within the apparatus. The specimen rests on two fixed knife-edges fitted with rockers. A third knife-edge, to which the straining clevis is attached by means of two nichrome stirrups extending through the bottom of the furnace, rests on the upper side and on the exact center of the specimen. The lever is of the simple type, having a 15 to 1 ratio at the straining clevis. The fulcrums are fixed, use having been made of the Emery fulcrum plate. The deformation of the specimen clay bar produced by the application of the strain at the center of the specimen is observed by means of three micrometer gauges. Three fused quartz rods, extending through the top of the furnace and resting on either end and in the center of the specimen directly over the knife-edges, transmit any flexure of

the specimen to the dials. Application of the load is obtained through the use of No. 12 shot used in one-half-pound increments. Valves actuated by solenoids permit accurate control of the load. The apparatus is also equipped with an automatic cut-off actuated at the instant the specimen is ruptured.

The accuracy of the apparatus was determined by measuring the deflection of cold-rolled steel. The stress-strain curve obtained with a maximum load of 420 pounds, applied in 30-pound increments at the straining clevis, showed the maximum variation to be less than 5 per cent of the theoretical value.

Seventeen sagger clays have been tested for moduli of elasticity and rupture at both room temperature and at the temperature at which saggers made from these clays failed in an air-quenching test. The data indicate that 13 clays have greater transverse strength and 4 clays a lesser strength at the higher temperatures. A wide variation was found to exist in the moduli of elasticity, ranging from a minimum of 706,000 lbs./in.^{2} to a maximum of 8,040,000 lbs./in.^{2} All but two clays show a greater modulus at the higher temperatures used than at room temperature.

MODULI OF RUPTURE AND ELASTICITY OF SOME GYPSUM MIXES

In "poured-in-place" construction work, where calcined gypsum is used as the cementitious material, it is common practice to mix from 12 to 15 per cent by weight of wood filler with the gypsum. A number of measurements have recently been made at the bureau to determine the effect of the amount and type of filler on the moduli of rupture and elasticity of "first-settle" and "second-settle" gypsum. The scope of the work was not sufficiently broad to be all inclusive, but it is felt that the results obtained are of interest in indicating the magnitude of these values with the mixes employed.

Four brands each of "first-settle" and "second-settle" gypsum and two kinds of wood filler, one a shredded cottonwood fiber, the other wood chips, were obtained as representative of the industry. Three specimens were made of each neat gypsum and three specimens of each gypsum when the filler content was varid by 1 per cent increments, from 12 to 15 per cent by weight of the dry mix. The mixes were cast in wooden molds, so as to produce specimens 3 by 3 by 30 inches. With the neat mortars the testing consistency of the American Society for Testing Materials [1] was used. When the wood fiber or chips were added it was found impracticable to use this consistency, so the mixes were made so as to pour readily. The specimens were dried in the laboratory for 14 days before testing.

The following table is a summary of the results obtained:

Effect of amount and type of filler on modulus of elasticity and modulus of rupture of gypsum

MODULUS OF ELASTICITY (LBS./IN.^{2})

Kind of gypsum	Wood fiber (percentage of filler)					Wood chips (percentage of filler)			
	0	12	13	14	15	12	13	14	15
"First-settle" calcined gypsum	409,000	199,000	158,000	113,000	79,000	192,000	158,000	129,000	92,000
"Second-settle" calcined gypsum	511,000	201,000	157,000	139,000	108,000	213,000	153,000	139,000	112,000

MODULUS OF RUPTURE (LBS./IN.^{2})

"First-settle" calcined gypsum	324	142	112	71	59	158	117	83	65
"Second-settle" calcined gypsum	299	167	144	109	86	156	116	97	77

[1] Standard methods of testing gypsum and gypsum products, Serial Designation C26-23, A. S. T. M. Standards, p. 775; 1924.

WATER CEMENT RATIO IN CONCRETE

Tests partially completed at the bureau giving information on the effect of water cement ratio are of interest.

Three cements designated by the letters A, B, and C ground to the same fineness in the same mill were made into concrete specimens, the same aggregate being used for all three concretes. The usual 1:2:4 by volume mix, Potomac River sand and gravel, the gravel carefully screened and recombined to give 10 different gradations of coarse aggregate, were used. One kind of sand was used in all cases. The grading of the coarse aggregate varied from a good gradation to poor. The poorest gradation of aggregates had the appearance of being worse than the fineness modulus figures of 5.2 indicated.

Sufficient water was added to the concrete to give approximately a measure of 95 per cent on the flow table. The slump varied from 5 to 6 inches. Concrete A made from cement A required slightly more water than B or C made from cements B and C, respectively.

Below are given the averages of the triplicate test specimens for the various ages and gradations. In these tables the strengths are expressed in percentages of the strength of the A concrete. It is obvious that the one concrete A is of higher strength than either B or C. It is questionable whether any difference in strength exists in either B or C.

Strength of B and C concretes of different gradations

Age in days	1		3		7		28	
Designation of concrete	B	C	B	C	B	C	B	C
Strength of various gradations of B and C concretes expressed as percentages of A concrete. A = 100 per cent in all cases.	70	76	61	67	65	62	84	74
	77	77	66	72	68	64	85	80
	87	86	70	72	70	68	83	81
	68	63	76	80	79	75	103	80
	88	105	70	72	98	68	83	77
	78	92	78	71	76	72	93	84
	96	103	68	69	74	67	90	82
	78	85	70	70	70	70	86	80
	77	85	63	59	70	62	87	73
	80	83	70	71	71	68	86	77
Mean value of strength in per cent of A	80	86	69	70	74	68	88	79
Strength of A in lbs./in.^{2}	180		910		1,370		2,700	

There is an indication that the B concrete is approaching the strength of the A concrete with increase in age. Concrete C gives a possible indication of an approach to the strength of A also, but not so markedly as B.

Without detracting from the pronounced change in strength resulting from the change of water cement ratio for a given cement and aggregate, the tests just quoted illustrate the fact that for a given aggregate any prediction or estimate of the strength of the concrete must take into consideration the difference in the cement itself, differences which in some cases may be considerable.

The cements gave the following results when tested as a 1:3 standard sand mortar in tension.

Cement	Per cent water for normal consistency	Strength in 1:3 briquettes	
		7 days	24 days
A	22.0	340	400
B	21.5	325	385
C	21.4	208	330

REVISED EDITIONS OF "A ZONING PRIMER" AND "A STANDARD STATE ZONING ENABLING ACT"

Revised editions of A Zoning Primer and A Standard State Zoning Enabling Act, under which municipalities may adopt zoning regulations, have just been issued. These publications, both by the Advisory Committee on Zoning, appointed by Secretary Hoover, rank among the most popular pamphlets issued by the department, more than 50,000 copies of each having been sold by the Superintendent of Documents.

The "primer" explains in popular style the methods by which zoning protects property and health and avoids unnecessary scrapping of serviceable buildings. It was first issued in 1922. Since that date the number of zoned municipalities in the United States has increased from less than a hundred to more than 450, and the constitutional status of zoning has been upheld in thoroughgoing decisions of the highest

courts of such States as New York, Massachusetts, Ohio, Illinois, and California. There has been a wealth of added experience in the application of zoning to the most varied problems in many types of cities and villages. The revised edition takes into account the developments of the past four and one-half years, and includes a list of zoned municipalities by States.

A Standard State Zoning Enabling Act has been embodied in the laws of 20 States since it was first issued in preliminary form three years ago. Court decisions on cases arising under it have been studied with the greatest care, and the only change in the text is in the section on "Enforcement and remedies," where the other means of securing compliance with zoning ordinances are strengthened by adding the following:

The local legislative body may provide by ordinance for the enforcement of this act and of any ordinance or regulation made thereunder. A violation of this act or of such ordinance or regulation is hereby declared to be a misdemeanor, and such local legislative body may provide for the punishment thereof by fine or imprisonment or both. It is also empowered to provide civil penalties for such violation.

Some of the introductory statements have been revised, and, in response to requests, a new footnote has been drafted on the subject of empowering communities to exercise zoning control over areas which are adjacent to the city's limits but do not lie within any other incorporated city or village.

Both these publications may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C. The price of both is the same, 5 cents per copy. The Zoning Primer is known as BH3a and the State Zoning Enabling Act as BH5.

PROGRESS IN SIMPLIFIED PRACTICE

The following article, which appears in the July 15 issue of the Iron Trade Review, may be of interest to those who are not thoroughly conversant with the cooperative services of the Department of Commerce in the program for the elimination of waste:

Efforts of the National Committee on Metals Utilization and the simplified practice division, Department of Commerce, to eliminate waste in many industrial fields have been hampered to some extent, it is stated, by certain technical and scientific organizations, which see imperfections in the working plans. The plans, it is admitted, are of a preliminary nature, and consequently they are subject to revsion, but the procedure of the Department of Commerce has been to allow for annual revisions to overcome obvious deficiencies.

The acid test of any formula or theory is the extent to which it can be applied practically and successfully. The fact is the Department of Commerce has admirable facilities for broadcasting and putting over these waste-elimination programs, even though they may be subject to change as they are tested. Where months and years might be consumed in bringing before industries the plans of simplification and standardization by technical and scientific bodies, even though plans might be more finished scientifically, the Department of Commerce is able to place them in working order in a much shorter time. If they are found impractical in some respects, they can be revised at the end of six months or a year. The economies of these programs, however, are effective at the start, it has been found.

A group of representative manufacturers of punches and dies, meeting under the joint auspices of the National Committee on Metals Utilization and the division of simplified practice, took initial steps on September 29 toward the simplification of their products. With a view to framing a tentative simplified practice recommendation to be presented to a general conferenec of manufacturers, distributers, and users at some future time, a simplified practice committee of the industry was appointed to make a survey of current practice, as a basis for a simplified list of sizes.

A representative group of manufacturers of white glazed tiles and unglazed ceramic mosaic have prepared tentative proposals for the establishment of uniform grade nomenclature and grade marks, the formulation of minimum grade specifications, and the certification of grades

In accordance with the unanimous action taken on September 22, 1926, of a general conference of representatives of manufacturers, distributers, and users of vitreous china plumbing fixtures, the

industry is being circularized for acceptance of the simplified practice recommendation which was developed covering standard nomenclature, definitions, and grading rules, as well as simplified types, sizes, and dimensions of staple vitreous china plumbing fixtures. The recommendations became effective October 1, 1926.

On September 23, 1926, a general conference of producers and consumers of veneer stock for wire-bound boxes was held in Chicago, at which a simplified practice recommendation was promulgated covering a simplified list of dimensions for air-dried and kiln-dried stock produced from gum, pine, and other softwoods. The recommendations will go into effect November 1, 1926.

Accepting simplified practice recommendations on steel reinforcing bars and steel spiral rods, one of the important manufacturing concerns in Texas says of the former: "It is evident that the simplified practice as applied to this commodity has been of great assistance to all interests and has lowered costs." Of the latter it says: "It is our opinion that the schedule adopted is in every way adequate for all buildings, and, as a result of the simplified practice, costs will be materially lowered."

The Atlantic Refining Co., manufacturing 521 brands of candles, has evolved a plan for simplifying production without disrupting the business. The plan involved (1) creation of a clear record, (2) an analysis of the line, (3) reduction of the number of products month by month, no matter how few are eliminated.

A standard practice for the painting of patterns has been adopted by the Joint Committee on Pattern Equipment Standardization, upon which nine interested national bodies are represented. The American Foundrymen's Association, which is sponsoring this project, has prepared a chart illustrating the recommendations.

The Committee on Standardization and Simplification of Store Stock of the Purchasing and Stores Division, American Railway Association, expressed the opinion that they could make much greater progress if other divisions of the A. R. A. representing the users of materials could be induced to lend the weight of their influence toward convincing their members of the benefits they may derive from the application of real standardization and simplification.

"The railroads have not reached the limit of their capacity," says W. R. Cole, president Louisville & Nashville Railroad Co. "They must continue to expand. The greatest field for real, constructive improvement lies in the coordination and intensification of facilities by further refinements in the existing plant, so that the output of transportation service per man, per unit of facility, and per dollar of investment will be increased."

One of the most significant examples of industry's progress in reducing costs through better material handling is that of one of the large automobile manufacturing concerns. The body plant makes just one type of body, in just one finish. It is simplification with no variations. Simplification is, of course, what makes it possible and profitable to build and equip so expensive a plant and to turn out in it a better product at a lower cost.

"Eliminating waste in office supplies and equipment" was the subject of an address by John Mitchell, Bureau of Methods, General Electric Co., before the thirteenth annual convention of the Society of Industrial Engineers at Philadelphia. By adopting the central-control method, the stock of standard forms, stationery, and office supplies of the General Electric Co. is maintained on a maximum and minimum basis. Thousands of dollars have been saved by eliminating certain grades of paper and envelopes and by the use of labor-saving devices.

In connection with the "certification" plan of the Bureau of Standards to further the use of specifications, a questionnaire was sent out by the Purchasing Agent Co. to 10,000 purchasing agents, designed to reveal the extent to which Federal master specifications are known

to and used by public and private buyers. The results of this survey will prove of vital interest to the industrial world. Replies are being analyzed daily, and summary of responses will appear in an early issue of the Purchasing Agent.

On a number of occasions the American Society for Testing Materials has called attention to the fact that "their standards produce their full usefulness only when they are applied as widely as possible in the purchase of materials; and that it helps and strengthens the work of the society when its standards are used in this way, and especially when credit is given to the society in using them. It has been well stated that if purchasers of materials who make use of A. S. T. M. standards in writing their own specifications will so indicate in some suitable way their specifications will not only have a more substantial basis but the effort toward simplification and standardization will be recognized and appreciated by all concerned."

In a recent article by an internationally known banker this rather significant statement is made: "Bankers to-day have a particular responsibility to take stock of the economic situation and to acquaint themselves with underlying conditions and tendencies that determine the course of business as a whole. Contacts established through the American Bankers' Association, the National Chamber, and through all the other valuable cooperative agencies which American business has set up for intelligent industrial teamwork, must be used by the banker so that he may have a broad and far-seeing view of business conditions, not alone as they affect one branch but as they affect the whole industrial mechanism. It is his part not only to warn of untoward developments and to exert his influence to stabilize business, but also to direct attention to healthy and progressive forces which make for national prosperity; and, when conditions warrant it, to encourage the extension of legitimate activities of business." Many bankers are focusing their attention on the movement for the elimination of waste through simplification as a very important factor in stabilizing business.

ERROR IN BULLETIN NO. 114

There is an error in the item "Effects of composition on the properties of ground coat enamels for sheet steel" on page 9 of Technical News Bulletin No. 114 (October, 1926). The first sentence of the second paragraph should read:

"In the work on ground coats a series of compositions was planned about each of three refractory bases, one of which comprised a frequently used ratio of flint and feldspar, another consisting of feldspar only, and the third of flint only."

NEW PUBLICATIONS

Additions to "Supplementary List of Publications of the Bureau of Standards" (Beginning July 1, 1925)

Scientific Papers[2]

S534. Effects of concentrated loads on the length of measuring tapes; L. V. Judson. Price, 10 cents.

S535. A fundamental basis for measurements of length; H. W. Bearce. Price, 5 cents.

Technologic Papers[2]

T323. Use of glue in coated paper; G. K. Hamill, V. H Gottschalk, and G. W. Bicking. Price, 15 cents.

T324. Standard hosiery lengths; E. M. Schenke and C. W. Schoffstall. Price, 10 cents.

Simplified Practice Recommendation[2]

(Elimination of Waste)

R48. Shovels, spades, and scoops. Price, 5 cents.

Building and Housing[2]

BH3a. A zoning primer. Price, 5 cents.

Handbook[2]

H8. Safety rules for the operation of electrical equipment and lines. Price, 15 cents.

Technical News Bulletin[3]

TNB 114. Technical News Bulletin, October, 1926.

---

[2] Send orders for publications under this heading with remittance only to Superintendent of Documents, Government Printing Office, Washington, D. C. "Outside publications" are not for distribution or sale.

[3] Subscription to Technical News Bulletin, 25 cents per year (U. S.); 40 cents (foreign).

Outside Publications

The structural factors in fire prevention. S. H. Ingberg; Quarterly of the National Fire Protection Association, vol. 20, No. 2, p. 170; October, 1926. (Republished from Proceedings of Building Officials' Conference, vol. 12, p. 126; 1926.)

The effect of the addition of kerosene on the oiliness of lubricating oils. S. A. McKee; Journal, Society of Automotive Engineers, vol. 19, No. 4, p. 356; October, 1926.

Letter on the advisability of preparing specifications for oil field goods. H. L. Whittemore; American Petroleum News, August 18, 1926. A method to distinguish viscose from cuprammonium rayon. W. T. Schreiber and H. A. Hamm; Textile World, October 9, 1926.

Technical aspects of the loss of the U. S. S. Shenandoah. (Contains report of Bureau of Standards) Journal, American Society of Naval Engineers, Vol. XXXVIII, No. 3; August, 1826.

Metals for use at high temperatures. H. J. French; Chemical and Metallurgical Engineering, vol. 33, p. 591; 1926.

Metallurgical research work of the Bureau of Standards. H. W. Gillett; Forging, Stamping, Heat Treating, vol. 12, p. 368; 1926.

Comparative tests on brick masonry. J. W. McBurney; The Bricklayer, Mason, and Plasterer, Vol. XXIX, No. 10, p. 225; October, 1926.

The fine structure of certain lines and energy levels of cadmium. Walter A. MacNair; Philosophical Magazine, vol. 2, p. 613; 1926.

Multipletts im spektrum des ionisierten vanadiums. II. W. F. Meggers; Zeits. f. Physik, vol. 39, p. 114; 1926.

Ueber die grundterme der spektren der ersten und zweiten grossen periode. O. Laporte; Zeits. f. Physik, vol. 39, p. 123; 1926.

Absorption spectra of the palladium and platinum triads. W. F. Meggers and O. Laporte; Physical Review, vol. 28, p. 642; 1926.

Relations between rotary power and structure in the sugar group. XVII. The structure of neolactose. Alfons Kunz and C. S. Hudson; Journal, American Chemical Society, vol. 48, p. 2435; 1926.

The occurrence of gentiobiose in the products of the commercial hydrolysis of corn starch. Henry Berlin; Journal, American Chemical Society, vol. 48, p. 2627; 1926.

WASHINGTON : GOVERNMENT PRINTING OFFICE : 1926